Third United Nations International Conference on the Peaceful Uses of Atomic Energy

A/CONF.28/A/220
UNITED STATES
February 1964
Original: ENGLISH

Confidential until official release during Conference

Abstract

NUCLEAR REACTORS APPLIED TO WATER DESALTING

James T. Ramey (Commissioner, U. S. Atomic Energy Commission)
Robert W. Ritzmann (U. S. Atomic Energy Commission)
James K. Carr (Under Secretary, U. S. Department of Interior)

In many areas of the world, available water supplies are inadequate to meet future needs. Especially critical water shortages exist in the Southwestern United States, Middle East, and North Africa.

Various alternative ways for supplementing natural water supplies have been and are under active study in the United States, chiefly by the Department of Interior, Office of Saline Water. One promising way is the production of water and by-product electricity in sea water desalting plants using reactors as the energy source.

Dual purpose plants offer more economic promise than single purpose water plants due to thermodynamic considerations and economies gained by the combination of two processes together in one larger plant. As in any dual purpose process, careful attention must be given to the method of cost allocation between the two products as the value assigned to one can have a significant effect on the cost of the other.

The Oak Ridge National Laboratory stimulated interest in the dual purpose water-power application through their studies which suggested that large nuclear reactors could produce both power and water at very low costs. These low costs resulted from the predicted sharp reduction in unit capital cost and fuel cycle cost, gained by scaling to very large sizes.

Since this initial stimulus, a number of economic and technical studies, covering a wide range of plant sizes has been conducted. A special interagency task group, involving the Atomic Energy Commission, Department of Interior, and Federal Power Commission, was organized under the auspices of the Presidential Office of Science and Technology. This group examined large

dual purpose plants using reactors from 1500 to 25 000 MW(th). Some 47 cases were analyzed with the by-product electrical outputs varying from 180 to 5950 MW(e) and water outputs from 170 to 2200 million gallons per day. The study showed that water could be produced at plant costs in the range of 23 to 33 cents per thousand gallons, assuming public financing. If more favorable financing were assumed or if the power were valued higher than in the study, water costs could be reduced to 10 to 20 cents per thousand gallons. Conveyance costs, which are quite dependent upon location and quantity of water handled, must be added to the above costs.

Of particular interest internationally is a scoping type of study being conducted for AEC and Interior for plants using 200 to 1500 MW(th) reactors. Three operational cases are being considered (water only, power only, and dual purpose) and six types of reactors are being evaluated (gas cooled, heavy water, light water, sodium graphite, and spectral shift).

The chief activity directed toward demonstrating technology has been the proposed project for the Florida Keys. An economic feasibility study has indicated that a plant producing 50 MW(e) and 10 million gallons of water per day offers an economical solution to their water shortage. Plans to proceed with construction of such a plant are currently under consideration.

Any reactor program for desalting plants must be coordinated with evaporator development and integrated into both the overall reactor and water programs for the area or country. Detailed technical and economic analysis is needed, showing comparisons with alternative methods of bringing water and power to the area, before embarking on specific projects.